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we trust you will find leisure from your more important and higher duties to relax occasionally by doing us the honour of attending some of our meetings, and examining the remains of ancient Irish art and literature which are preserved in our Museum and Library. We beg to express our anxious hope that the period of your Excellency's administration in Ireland may prove an era distinguished by the promotion of peace and prosperity, the development of the industrial resources of the country, and the advancement of those literary and scientific pursuits to which the Royal Irish Academy is more especially devoted."

HIS EXCELLENCY returned the following reply :—

"GENTLEMEN,—It gives me much pleasure to meet a deputation from so distinguished a body, and to receive your congratulations on my re-appointment to the government of Ireland. The years that have passed since I was in Dublin have not driven from my recollection the history of your Society, or the knowledge of the beneficial effect which such a Society as yours has in promoting scientific attainments, not only in the city, but over the whole country. Any institution or any pursuit which brings together with a common or a praiseworthy object men who differ in religion and political questions is well worthy of support; and as I am by my official position the Visitor of your Academy, I hope I may have an occasional opportunity of relaxing and improving my mind by a glance at the curiosities which you have amassed."

JOHN R. KINAHAN, M. D., read the following paper—

ON OLDHAMIA, A GENUS OF CAMBRIAN FOSSILS.

IN certain schistose beds of the Cambrian series, as seen at Bray Head and other places in the county of Wicklow, and at Howth in the county of Dublin, are found masses of peculiar markings, which the eye readily recognises as casts of an animal belonging either to the Polyzoon or Hydrozoan alliance. Although at first sight there may, especially to an untutored eye, appear to be some resemblance between these markings, and the multiform shapes which masses of crystal assume, yet a consideration of their symmetrical regularity of form, their constancy of direction with regard to the bedding, their frequent occurrence and permanency of character in even dissimilar beds, situate at great distances from each other; their association with traces of the remains of animals of aquatic habits; and their close agreement in form with beings living at the present day,—lead us to dismiss as untenable every theory which would assign to them aught save an organized origin. Geologists of the present day, without hesitation, admit *Oldhamia*—as the genus founded for the reception of these fossils, in 1848, by Edward Forbes is called, in honour of Professor Oldham, who first noticed their existence

Fig. 1.

in 1844 (*vide* "Proceedings of the Geological Society of Dublin," vol. iii., p. 66)—among the list of fossils. But, although the former animal nature of these beings is now admitted, their exact position in the scale is by no means free from doubt; nor need we wonder at this when we recollect that but a few years since the two great families—to both of which *Oldhamia* has been referred by different observers, viz., the Polyzoan Mollusca and the Hydrozoan Acrita—were confounded together, and that in many cases (widely different as the animals composing these two classes are in the structure and relations of their organs), even among recent species it is impossible *a priori* to declare, from the skeletons alone, whether we have a Polyzoan or a Sertularian under examination, and we are only able to solve the question by reference to the soft parts of the animals. The only author who has, as far as I can learn, written on the subject, whose opinion is worth any attention, is the late Professor E. Forbes, and if I venture to differ from his published opinions, it is because my conclusions are based on a careful study of the rocks and fossils, on a more extended scale than had been made by him. At the same time I freely admit that it is extremely difficult to adduce any arguments in favour of the Hydrozoan nature of these fossils which will appear conclusive on paper, this conclusion being the result of a careful consideration and comparison of such details of structure as the fossils

Fig. 2.

afford, and based on characters of a general nature, drawn from appearances, even tangible enough to the eye, but utterly impossible to be described with precision. I cannot discover or appreciate what the characters are which lead Professor Forbes, "speaking of their possible Polyzoan nature," to use the words, an alliance more in accordance with the minute structure; careful casts, taken from *Old. antiqua* and from specimens of *Sertularia argentea* imbedded in plaster, are so much alike, that some years since they would certainly have been pronounced not merely generically, but even specifically, identical.

Two distinct forms at least of these fossils exist, both of which were named by Professor E. Forbes, and have been described somewhat at length by me in a paper read before the Geological Society of this city (*vide* "Proc.," vol. viii.). They differ so much that I almost question the convenience of associating them under the same genus, one (Fig. 1) being furnished with a distinct axis, from either side of which alternately ranged branches proceed at regular intervals (*O. antiqua*), whilst the other (Fig. 2) is destitute of any axis, made up of many stems of irregular length, springing from a common point, so that the fossils flattened from above present the form of a star, more or less regular according as the axes are equal in length or not. Some of these are so irregular, however, that the radial character is almost lost, and they might be taken for another species; but I think specimens sufficiently intermediate in character exist to refute this view. There is no difference in the mode of the occurrence of these species,—masses of the animals compressed together in layers and intermingled in the beds of what evidently once was sandy mud. Occasionally we find scattered fans of *O. antiqua*, or single stems of *O. radiata*, and sometimes we get the whole mass so compressed and confused as to render it impossible to make out the parts distinctly. The species are generally found apart. I possess one specimen a quarter of an inch thick, in which a bed of *O. radiata* overlies a bed of *O. antiqua*, so that the specimen exhibits the two species on its opposite sides, and I have found scattered fans of *O. antiqua* among *O. radiata*. It would appear, then, that the two species lived under different circumstances, and had thus remained distinct even after death, just as at the present day we will find two distinct species of a group inhabiting the same seas at different epochs, the conditions which fit it for the existence of the one not being compatible with the well-being of the other. There is a form of *O. radiata* (?) which might be easily mistaken, on hasty examination, for *O. antiqua*, a mistake I have seen occurring even in museum collections. It appears to be formed by the overlapping of a number of the tufts of *O. radiata* in an alternate manner; but the absence of the rachis distinguishes it at once. Sometimes we find the same form much drawn out and elongated. This, sometimes at least, is due to the distortion dependent on cleavage; but in other specimens it is a genuine character dependent on the mode of growth of the Polypidom itself, a form of development familiar to every zoophytologist. The cells in which these animals dwelt appear to have been in *O. antiqua* biserial and alternate; in some specimens of *O. radiata* a similar arrangement is remarkably evident, but in others belonging to the second form described, and in which the termination of each of the axes is enlarged, this arrangement is not so evident. Springing from the axils of these cells in one or two of my specimens of *O. radiata* are somewhat elliptical bodies, which, although not strongly marked, are, I think, sufficiently so to satisfy me in considering them as oviferous capsules; I have not detected these organs in *O. antiqua*. One form of *O. radiata* presents the appearance of long, unbranched axes. This is an appearance also well known among recent Hydrozoa.

These are the more important points I have been enabled to make out regarding this genus as established by Forbes, and, taking into consideration the close approximation, almost amounting to identity in form, which exists between these and the Sertularia, their mode of growth, as far as we can judge, and place of occurrence, being so similar,—so much so that a superficial examination would lead one to pronounce them identical,—I think we are justified in considering these rather Sertularian Polypidoms than Polyzoan Cænæcia,—a view of the genus which, I am convinced, further research among living forms will eventually prove to be the correct one.

G. JOHNSTONE STONEY, A. M., read the following—

NOTES ON THE MOLECULAR CONSTITUTION OF MATTER. NO. I.

THE extraordinary power of the general method in Mechanics which we owe to the genius of Lagrange has tempted several mathematicians to try its strength in studying the unknown forces which enter into the molecular constitution of matter. In the applications of this method which have been hitherto made, as well as in other mathematical investigations into molecular forces,* the body under consideration has been supposed in its usual condition to consist of molecules:—

1°. At rest—

2°. Resembling one another, and similarly placed, each acting on its neighbours within a certain range—

3°. By forces adequately represented by functions multiplying the masses of the attracted and attracting molecules—

And which are such that the action on any one molecule may be represented by integrals extended through the sphere of action. In order that these integrations may be legitimate, it is necessary—

4°. That the sphere of action round each molecule include an immense number of other molecules, no one of which contributes more than an infinitesimal part to the total action on the central one; and—

5°. That the contributions from any two consecutive molecules be almost undistinguishable either in direction or amount.†

These hypotheses involve some remarkable results, the examination of which will enable us to limit the area of our search in prosecuting the study of molecular physics.

* See CAUCHY: "Sur l'équilibre et le mouvement d'un système de points matériels sollicités par des forces d'attraction ou de repulsion mutuelle."—*Cauchy's Exercices de Mathématiques*, tom. iii., p. 202; and "De la Pression ou Tension dans un Système de points matériels."—*Ib.*, p. 224. NAVIER: "Sur les lois du mouvement des fluides."—*Mémoires de l'Institut*, tom. vi., p. 389; and "Sur les lois de l'équilibre et du mouvement des corps solides élastiques."—*Ib.*, tom. vii., p. 375. POISSON: "Sur les équations générales de l'équilibre et du mouvement des corps solides élastiques et des fluides."—*Journal de l'Ecole Polytechnique*, Cahier xx., p. 1. HAUGHTON: "On the Equilibrium and Motion of Solid and Fluid Bodies."—*Trans. Royal Irish Academy*, vol. xxi., part 2. JELLERT: "On the Equilibrium and Motion of an Elastic Solid."—*Ib.*, vol. xxii., part 3.

† The last two hypotheses, which must be insisted on if the method of integration be